The Marquis G. de Saporta (*Annales des Sciences Geologiques*, 1889,) contributes an article upon the fossil plants of Aix, in Provence, studied stratigraphically and paleontologically. The plates illustrative of the shells of the Aix group accompany the memoir.

Additions to the vertebrate fauna of the Preglacial Forest Bed of the Norfolk coast increase through the rapid denudation carried on by the North Sea, and Mr. E. T. Newton has in the April issue of the *Geological Magazine* described *Cervus rectus* n.sp., and recognised the presence of *Bison bonasus*, *Phoca barbata*, the narwhal, the beluga and the porpoise.

H. H. Howorth, M. P. (*Geol. Mag.*, July, 1889) states his belief that in the mammoth age the Arctic Ocean either did not exist, or was very small, the greater portion of its area being occupied by land upon which trees would grow. The continents would therefore be united by land, and an ample bridge provided. This land area would partially account for the warmer climate.

MINERALOGY AND PETROGRAPHY.[1]

Petrographical News.—In his report on the geology of the Rainy Lake region, Dr. Lawson[2] gives a petrographical description of the rocks comprising the Laurentian, Coutchiching and Keewatin groups in the neighborhood of the above-named lake in Canada. The rocks of the Keewatin series are principally bedded traps and greenstones, altered from traps by metasomatic and dynamic metamorphism, and greenstones of clastic origin, hornblende schists and other foliated rocks. The effect of pressure is shown in the broken condition of many of the crystals in the rocks; crushed and sundered plagioclase, apatite, hornblende, leucoxene, tourmaline and quartz are all described and figured. Between the hornblende schists and the Laurentian gneisses the author recognizes phenomena which he believes to be due to contact action. If this supposition is found to be a correct one, the fact affords a striking confirmation of the view that the gneisses under the

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] Geol. and Nat. Hist. Surv. of Canada. Annual Report for 1887. Pt. F.

Keewatin are of eruptive origin. The Coutchiching series embraces mica-schists and other lighter colored schistose rocks between the lowest members of which and the gneisses are also evidences of contact action. Among the lighter schists are granulites and sericite-porphyroids. In the Laurentian a hornblende-syenite gneiss occurs, and in it several pieces of twinned sphene were observed.——The two craters Mte. Cimino and the Lago di Vico [3] in central Italy, though but parts of the same great volcano, like Mts. Somma and Vesuvius, have during their different periods erupted different kinds of lava. The lavas of Cimino have an andesitic habit. They are to be classed with the mica and augite andesites, the latter of which contain porphyritic sanidine and olivine. The younger crater, Lago di Vico, has poured forth leucite bearing rocks, of which leucitophyre, leucite-tephrite, leucite-basanite and phonolites are the prevalent types. A leucite-trachyte, placed by Rosenbusch among the phonolites, is the latest lava of the older crater. It is an intermediate type between the predominant lavas of Cimino and those of the later Lago di Vico. Besides the lavas, the former crater cast forth sanidnite bombs and calc-silicate bombs, containing garnets and vesuvianite.——In a brochure on the Obere Weilerthal, E. Cohen [4] gives an interesting account of the eruptive and sedimentary rocks occurring in the Weilerthal south of the rocks made famous by Rosenbusch under the name Steigerschiefer. Those described by Cohen are granite, gneiss, quartzite-schists, phyllites, granite, porphyry, augite porphyry and minettes. In the granite is a brown hornblende in prismatic crystals. Their specific gravity varies between 3.082 and 3.140, and their composition is as follows:

	SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	Na_2O	H_2O
Darker var.	51.36	4.14	2.17	10.04	11.91	17.14	1.86	1.38
Lighter var.	51.82	4.17	2.34	9.84	12.18	17.18	1.34	1.13

Many of the other rocks described present interesting features, but none of great petrographical importance.——An examination [5] of the northern slopes of Cader Idris, Merionethshire, Wales, discloses interbedded slates, tuffs, and massive eruptive rocks of considerable interest. Among the sedimentary rocks is the well-known pisolitic ironstone, in which the pisolitic structure is now represented by magnetite crystals in a cement of green iron silicate. This structure was originally pro-

[3] W. Deecke, *Neues Jahrb. für Min.*, B. B. VI., 1889, p. 205.

[4] Abh. zur Geol. Specialk. v. Elsass-Lothringen, B. III., H. III., p. 137.

[5] *Quar. Journ. Geol. Soc.*, August, 1889, p. 432.

duced by the tendency of some carbonate to form concretionary masses around grains of sand or small shells. The original carbonate has for the most part disappeared, leaving the magnetite as a pseudomorph. Among the eruptives is a rock that the author calls eurite, following d'Aubuisson,[6] although it would seem that the name quartz-keratophyre would sufficiently well characterize it. The rock is a bluish-gray compact substance with a specific gravity of 2.64. It contains quartz and feldspar crystals, wisps of biotite and spherulites of granophyre, more particularly around the porphyritic crystals, in a groundmass composed principally of a chloritic substance. Its analysis shows it to contain a soda-rich feldspar:

SiO_2	Al_2O_3	Fe_2O_3	MnO	CaO	MgO	K_2O	Na_2O	Loss
72.79	13.79	3.32	tr.	1.94	.62	2.99	4.12	1.08

——In his description of the section Tanneberg of the geological map of Saxony, Dalmer[7] mentions two rocks of some interest. The first is a sericite-gneiss, composed of quartz, plagioclase and sericite, with a breccia-like structure produced by pressure. The quartz and plagioclase are shattered, and the broken pieces are reunited by a cement of secondary quartz and sericite. The second is a chlorite-gneiss, consisting of orthoclase, albite, chlorite and quartz. This occurs in varieties of different degrees of coarseness. As it becomes finer in grain it loses feldspar, and assumes muscovite, until finally it approaches in structure and composition the phyllites of the region.——Kendall[8] gives a list of the basic dykes on the island of Mull that contain the glassy selvages known as tachylite. It has been observed that the thickness of this glass band is always greatest in that portian of the dyke in contact with the most compact rock. A new type of tachylite, called by Groom[9] carrockite, is associated with gabbro at Carrock Fell in the Lake District, England. It consists of a green glass enclosing spherules of quartz, feldspar, and granular aggregates of augite, and porphyritic crystals of the same minerals.—Prof. Bonney[10] has examined certain banded micaceous schists from Morlaix, Brittany, which he thinks are the result of pressure and contact action. The rocks were originally stratified sands and muds, that were crumpled and foliated by pressure, and in which a light and a dark mica, chiastolite and andalusite were developed. By the subsequent intrusion of gran-

[6] Traité de Geognosie, 1819, p, 117.
[7] Erl. z. Geol. Specialk. des Königr. Sachsen Blatt, 64.,
[8] *Geol. Mag.*, Dec., 1888, p. 555.
[9] *Geol. Mag.*, Jan., 1889, p. 43.
[10] *Quart. Jour. Geol. Soc.*, Feb., 1888, p. 11.

ite all traces of their fragmental origin were obliterated; the rock became crystalline, and a few additional minerals were produced.——The first occurrence of glaucophane as a consitutent of British rocks is noted by Blake[11] in an altered diorite from a quarry near the Anglesea Monument, Anglesea. The rocks consists of chloritized glaucophane, grains of epidote, a rutile quartz and calcite. The glaucophane is present in elongated prisms, which form a felt around epidote, and are included in the quartz.

Mineralogical News.—*Morphological and Physical Properties.*—The possibility of the selection of half the planes of the monoclinic hemi-pyramid in such a way as to fulfill the conditions of hemihedrism has been shown by Williams.[12] If two of the planes intersecting in the plane of symmetry be allowed to develop to the exclusion of the other two, there results an apparent hemimorphism, which in reality satisfies all the conditions of hemihedrism. The monoclinic plane of symmetry remains, so that the character of the hemihedrism is the inclined-faced. Planes belonging to this hemihedral form are exhibited in pyroxene from Piedmont, Orange, and St. Lawrence counties, N. Y., and from Canaan, Conn. The habit is always hemimorphic.——In a recent paper Mügge[13] records some interesting observations on parting planes in several minerals. He describes rutile from the Urals in which the usual cleavage parallel to $\infty P\infty$, is wanting, its place being taken by a parting parallel to $\frac{3}{2} P\infty$, but whether as a result of twinning or not, Mügge is unable to decide. The author thinks that this variety of rutile is identical with the mineral from Polk county, N. C., described by Des Cloizeaux[14] as a dimorphous form of rutile. A garnet from Arendal, Norway, possesses cleavages parallel to the dodecahedral face, and contains acicular inclusions of cyanite with their $\infty P\overline{\infty}$ faces parallel to the ∞O faces of the garnet, and their *c* axes parallel to the edges of these faces. The mineral occurs in a schistose dioritic rock whose hornblende constituent has a well-developed parting parallel to $P\overline{\infty}$. Parting parallel to an octahedral face, in many members of the spinel group, is declared to be the result of polysynthetic twinning. Calcite, with a parting parallel to $\infty P2$, galena with twinning lamellæ parallel to $4O$, and breunerite, with $-2R\ 2R$ as the twinning plane, are also mentioned.——Boracite from

[11] *Geol. Mag.*, 1888, p. 125.

[12] *Amer Jour. Sci.*, Aug. 1889, p. 115. Cf. AMER. NATURALIST, Nov. 1887, p. 1025.

[13] *Neues Jahrb. f. Min.*, etc., 1889, I., p. 231.

[14] *Bull. Soc. franc., d. Min.*, IX., 1886, p. 184.

Lüneburg, Hanover, contains the new planes $\infty O\frac{5}{3}$, $\infty O\frac{13}{8}$, $\infty O\frac{17}{8}$. ——Beginning with the Le Bel and Van t' Hoff theory with regard to the connection between the structure of the molecule (*i. e.*, the arrangement of the atoms within the molecule) and the activity of circularly polarizing substances, and applying the principles of this theory to the Sohacke-Wulff[15] theory of crystal structure, Becke[16] is forced to conclude that this theory of crystallization is not satisfactory, since it does not account sufficiently well for the close relation that exists between the crystallization of a body and its chemical nature. Becke thinks that the symmetry of crystals is intimately dependent upon the symmetry of arrangement of the atoms within the molecules. If this be true, all circularly polarizing bodies should possess an unsymmetrical molecule, which should reveal itself through the unsymmetrical character of its crystallization. Becke publishes a list of all the circularly polarizing substances known, and discusses in detail the crystallization of grape sugar, since this has been regarded as a triclinic substance, without evidence of hemimorphism or hemihedrism—the only two modes of crystallization that can yield enantiomorphous, *i. e.*, unsymmetrical figures. As a result of measurements of crystals of pure sugar, Becke concludes that it is monoclinic with $a : b : c = 1.735 : 1 : 1.908$. $\beta = 97° 59'$, and hemimorphic in the direction of the c axis (really hemihedral, as indicated by Williams, ref. above). It is therefore enantiomorphous. The symmetry of its form corresponds with that of other circularly polarizing bodies, and corresponds also with the unsymmetrical structure of its chemical molecule, shown by recent synthetical methods. Two of these unsymmetrical molecules may be so arranged as to yield a crystal with one plane of symmetry (holohedrally developed monoclinic form), and four to produce forms with three planes of symmetry (orthorhombic forms). The symmetry of crystal forms thus depends primarily upon the distribution of the atoms within the molecule, Von Goldschmidt,[17] carrying out this idea more fully, attempts to simplify the discussion of the chemical relations of the silicates by making certain assumptions with regard to the conditions necessary to the mixture of molecules in groups of isomorphous silicates. He regards the particles as the primary constituent of the molecule, just as the atoms are the constituent parts of the molecule. Chemistry he defines as relating to molecules and their composing atoms; crystallography as relating to crystals and their composing particles. Isomorphism is the

[15] AMERICAN NATURALIST, 1889, p. 221.

[16] *Min. u. Petrog. Mitth.*, 1889, p. 464.

capacity of analogous particles to form similar crystals. Similar or analogous particles are those built on the same plan, though different in composition. Starting with these general ideas the author discusses the character of the particles forming the silicates, and concludes by applying his deductions to the explanation of the formulas of the most important silicates.——The examination [18] of senarmontite crystals in thin sections parallel to the cubic, octahedral and dodecahedral faces, shows that the apparently simple crystals are combinations of six orthorhombic crystals, and that the optical anomalies so frequently observed in the mineral are due to this intergrowth, or to twinning. Unlike the double refraction of some other apparently regular minerals, the anomalous action of senarmontite is not in the least affected in a temperature as high as 360°.——Mügge [19] has reinvestigated the subject of pressure twinning in sphene, and finds the twinning plane to be in the zone between ∞P and —P (DesCloizeaux's position), and not to coincide exactly with —2P, as determined by Williams. He ascribes the striations frequently observed in the sphene of plutonic rocks to pressure, but is not able to produce them by artificial means. ——As a result of measurements made in crystals of zinc obtained by slow distillation of the metal in a vacuum, Williams and Burton [21] have calculated the axial ratio to be $a : c = 1 : 1.3564$. The crystals are hexagonal, with a probable rhombohedral symmetry, and isomorphous with arsenic, antimony, bismuth, and tellurium.——In the pyroxene from Pinzgauer, Cathrein [22] has discovered the forms $\frac{3}{2}P\overline{\infty}$, $P_{\overline{4}}$, $\frac{1}{5}P\frac{}{2}$, all of which are new to the species. In amethyst from the Zillerthal he has found the new planes

$$\tfrac{7}{5}R, +\frac{P\frac{12}{11}}{4} \text{ r. l., } +\frac{\frac{9}{10}P\frac{9}{8}}{4}r, \text{ and } \frac{\frac{9}{8}P\frac{9}{7}}{4}l$$

while the forms most common to the mineral are absent.——The new plane $\frac{7}{16}P$ is recorded by Cèsaro [23] as occuring on topaz from Saxony.

Miscellaneous.—Retgers [24] has made a careful examination of the heavy solutions used for separating rock constituents with the endeavor

[17] *Zeitschrift. für Min.*, XVII., p. 25.

[18] Prendel, *Min. u. Petrog. Mitth.* XI., p. 7.

[19] *Neues Jahrb. f. Min.*, etc., 1889, II.. p. 89.

[21] *Amer. Chem. Jour.*, XI., p. 219.

[22] *Zeits. f. Kryst.*, XVII., 1889, p. 19.

[23] *Bull. Soc. Franc. de Min.*, XII., p. 419.

[24] *Neues Jahrb. f. Min.*, 1889, II., p. 185.

to obtain modifications with a specific gravity greater than 3.6. His investigations result in the discovery that methylene-iodide will dissolve iodine and iodoform, and yield a liquid with the density of 3.6. For separating minerals with a greater density than this, he suggests the use of fused silver nitrate. At 198°, this salt melts to a colorless liquid, with the density 4.1. A mixture of the nitrate and iodide of this metal give a yellow oily liquid at a temperature of 65°–70°, whose specific gravity (5) is greater than that of any other substance, that has yet been proposed for the purpose desired. The author declares that these liquids serve as convenient means for separating the heavier minerals of rocks, and he gives directions for manipulating them.——The origin of most of the siliceous sinter deposited by the geysers in the Yellowstone Park is stated by Mr. Weed[25] to be due to a secretion of silica by algæ and mosses. Waters too poor in silica to form deposits of this substance by cooling or evaporation, are often dammed back by thick jelly-like accumulations of silica, separated from the water by plant life, which is quite abundant in some of the hot springs. The geyserites and similar bodies are produced by evaporation.

[25] *Amer. Jour. Sci.*, May, 1889, p. 351.